

MACRUROUS DECAPODS FROM THE CRETACEOUS OF QUEENSLAND

JACK T. WOODS

Queensland Museum

The collection of more material and greater preparation of existing material has allowed the redescription of the macrurous decapods studied by Etheridge Jr. (1914, 1917), as well as the description of four additional species from the Lower Cretaceous marine rocks of Queensland. This fauna is richer in species, but less prolific in individuals, than the *Brachyura* described by Woods (1953); it also covers a greater range both stratigraphically and geographically.

Five of the species were collected at Currane, near Dartmouth, in Central Queensland, from the Tambo Formation of Upper Albian age. At this locality fossil remains of decapods, together with those of cephalopods and pelecypods, are abundant in calcareous concretions, readily collected from the ground surface and the bed of Brutus Creek. These concretions have been derived from a sequence of soft buff calcareous siltstones, which weather easily and outcrop only in a few flood scours in the banks of the creek. The sediments are nearly horizontal and the country is lowly undulating grassland. The other three species are from widely scattered localities in rocks of Aptian age; their field occurrence has not been personally investigated.

Specimens revealed by splitting calcareous concretions are often preserved as internal moulds, partially covered with shell material, associated with external moulds in the form of counterparts. Latex and plaster casts taken from prepared counterparts were found useful in the study of ornament. Specimens were coated with ammonium chloride before photography.

I am indebted to Miss Sanna Shannon, who has presented collections of fossils from Currane to the Queensland Museum on several occasions, and to Mr. and Mrs. W. S. Shannon for hospitality in the field. Mr. Frank Blain was helpful in many ways in the field work at Currane. I wish to thank Professor W. H. Bryan for the opportunity to study material in the collections of the Department of Geology, University of Queensland, and Dr. A. B. Walkom for providing a plaster cast of the type of *Enoplocyrtia terrae-reginae* Etheridge Jr. in the collections of the Australian Museum, Sydney. Specimens were obtained on loan from the collections of the Geological Survey of Queensland through the courtesy of the late Mr. C. C. Morton.

The repositories of material described are indicated by the abbreviations :— Queensland Museum (Q.M.); Department of Geology, University of Queensland (U.Q.); Geological Survey of Queensland (G.S.Q.); Australian Museum, Sydney (A.M.).

THE APPLICATION OF THE TERMINOLOGY FOR THE FURROWS OF THE CARAPACE

In describing species belonging to the related astacuran families Erymidae and Nephropsidae and to the morphologically comparable Glypheidae, an attempt has been made to employ a uniform terminology for the carapace furrows with a view to the expression of their homology, tempered with due regard for established usage of the terminology. The standard abbreviations for the furrows have been used in the discussion and in the accompanying illustrations.

The primitive condition of furrowing in the Erymidae exists in *Clytiopsis argenteratensis* Bill from the Lower Triassic of Alsace. As figured by Beurlen and Glaessner (1930, fig. 2) the three transverse furrows, *a*, *c*, and *e* are distinct and subparallel; *b'* is subhorizontal and links *a* with *e*. By comparison, some later Erymidae and all Nephropsidae, Astacidae, Parastacidae, and Austroastacidae exhibit the transverse furrows variously reduced and confluent.

Several species of *Eryma* von Meyer have *a* and *c* subparallel and separate, but *c* may weaken ventrally. In others, notably *E. ventrosa* (v. Meyer), *a* and *c* are approximate and linked in the middle of their course (figure 1). The patterns of furrowing in *Enoploclytia* McCoy, while variable, can be readily reconciled with those in *Eryma*. Of the forms with *a* and *c* distinct and subparallel, three, *E. kimzeyi* (Rathbun), *E. tenuidigitata* sp. nov. (figure 5), and *E. terrae-reginae* Etheridge Jr. (figure 6), are remarkable for the production of *c* to join *b'* adjacent to the eminence ω . The variability of the furrowing within the type species, *E. leachi* (Mantell), as figured by Mertin (1941, fig. 5) may be interpreted in terms of that in *Eryma ventrosa*: *c* is weak or absent ventrally, *a* is weak or absent centrally and dorsally while the linkage is maintained. Furrow reduction is extreme in some species; for example, *E. tuberculata* (Bell) where the single transverse furrow posterior to *e* may represent *a* ventrally and *c* dorsally.

In the Nephropsidae *e*, *b'*, and *i* may be reduced as well as *a* and *c*. With the exception of *Palaeonephrops browni* (Whitfield) where *e* almost reaches the mid-line (figure 1), this furrow is restricted to its ventro-lateral development. Dorsally *c* is

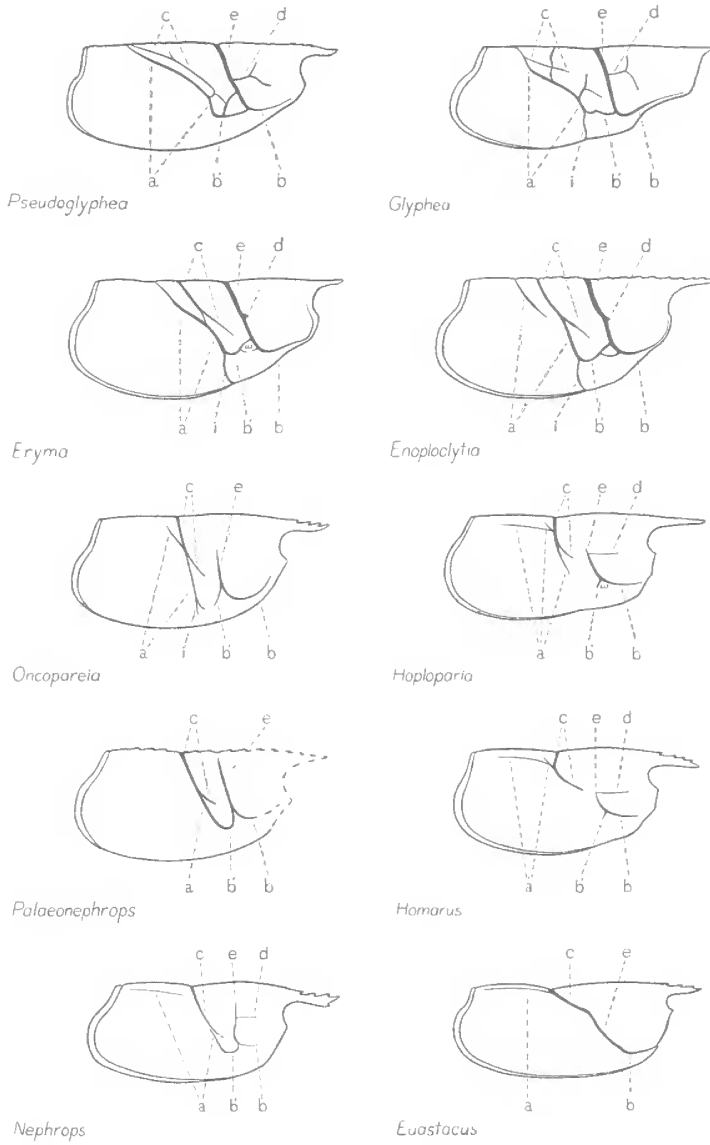


Figure 1. A comparison of the furrowing of the carapace in genera of the Glypheidae, Erymidae, Nephropsidae, and Parastacidae.

a, branchio-cardiac furrow; *b*, antennar furrow; *b'*, hepatic furrow; *c*, post-cervical furrow; *d*, gastro-orbital furrow; *e*, cervical furrow; *i*, inferior furrow.

always prominent, ventrally it often curves toward *e* and may reach it as in *Tillocheles shannonae* gen. et sp. nov. (figure 8) and the living *Homarus americanus* Milne-Edwards. Some species of *Homarus* Weber and *Hoploparia* McCoy exhibit *a* divided in its dorsal development. The oblique anterior branch is apparently the homologue of *a* of the Erymidae, while the sublongitudinal posterior branch is literally a branchio-cardiac furrow in that it indicates the separation of the respective organs in the postero-dorsal part of the cephalothorax. The ventral development of *a* is prominent in species of *Oncopareia* Bosquet and in the form described by van Straelen as *Homarus pelseeneeri*. In the latter, as van Straelen indicated (1936 b, p. 19), *a* is tangential to *c* and is produced ventrally to join *b'*. Where *i* is absent and *a* and *b'* are collinear the limits of these two furrows are arbitrary. In *Hoploparia* *a* is typically produced ventrally beyond its confluence with *c* to the level of the short oblique development of *b'*, while in *Homarus* this ventral extension is typically lacking. In the living *Nephrops norvegicus* (Linn.) the ventral development of *a* joins *b'*.

Examination of several recent parastacids shows that the common condition of the furrowing, as exemplified in *Euastacus* sp. (figure 1), involves the weak sub-longitudinal development of *a* and its junction anteriorly with *c*. This latter furrow, which is deep and oblique, extends from the midline and joins, at a wide angle, *e* at its dorsal extremity. In *Engaeus* Erichson *a* is dorsally sublongitudinal, but curves anteriorly to become subparallel to *c* before fading on the sidewall.

The pattern of furrowing in the early glypheid genus *Pseudoglyphea* Oppel (Middle Triassic-Lower Jurassic) is readily comparable with that of the Erymidae. However, a short transverse furrow tends to join *c* to the mid-line; *c* and *a* are linked anteriorly, and in some species *c* is joined to *b'*. In the type species, *P. grandis* (von Meyer), an area corresponding in position with the eminence ω of the Erymidae and Nephropsidae is completely bounded by *b'* and *e* dorsally and a weak subhorizontal connecting furrow ventrally (figure 1). In species of *Glyphea* von Meyer (Lower Jurassic-Upper Cretaceous) *c* may be variously cross-linked with *a* and, particularly in Cretaceous forms, may be weak or incomplete. Only the posterior part of the furrow commonly described as the hepatic furrow in the genus is apparently homologous with *b'* in *Pseudoglyphea* and the Erymidae. The anterior part, often delimited by a short dorsal projection, may be the equivalent of the subhorizontal connecting furrow in *Pseudoglyphea*. Reduction and weakening of the furrowing in the Glypheidae is greatest in *Mecochirus* Germar and *Meyeria* McCoy.

Tribe **SCYLLARIDEA** StebbingFamily **PALINURIDAE** White**ASTACODES** sp.

Plate 4, figure 1 ; figure 2

MATERIAL.—F. 2907, Currane, 10 miles N. of Dartmouth, Central Queensland (Q.M.). Incomplete, obliquely compressed abdomen preserved as partially eroded skeletal material and counterpart of right side ; in buff calcareous siltstone.

AGE.—Upper Albian (Tambo Formation).

Abdominal tergites punctate, transversely convex, longitudinally with weak, smooth median carina ; first with deep transverse furrow passing obliquely to delimit small pleural wing ; remainder posteriorly with weaker transverse furrows, deepening laterally and curving antero-ventrally, then anteriorly, to partially delimit pleurites. Pleurites subtriangular, with prominent curved ventral spine and four or five small blunt spines on postero-ventral margin ; second also slightly spinate on antero-ventral margin and exhibiting anteriorly an oblique furrow.

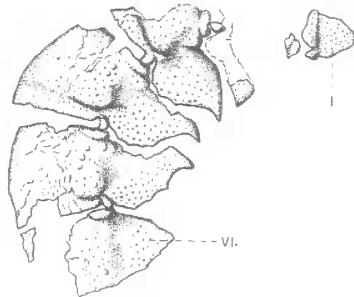


Figure 2. *Astacodes* sp. Lateral view of right side of imperfect abdomen ; drawn from cast from prepared counterpart, F. 2907 (Q.M.) ; natural size.

I, VI, abdominal segments.

Apart from the type species, *A. falcifer* Bell (1863) from the Hauterivian of England, only two species of *Astacodes* have been recorded : *A. maxwelli* Stenzel (1945) and *A. davisii* Stenzel (1945), respectively from the Santonian and Turonian of Texas, U.S.A. The described specimen approximates in size the abdominal remains of *A. maxwelli* but differs in the possession of a median carina. The shape of the pleurites readily distinguishes it from representatives of *A. falcifer* and *A. davisii*.

The specimen was obtained by Miss Sanna Shannon in 1949, but subsequent extensive collecting in the area has failed to reveal additional remains. The species is undoubtedly distinct, but is not formally named because the specimen could not adequately serve as the type.

Tribe **GLYPHEIDEA** van Straelen

Family **GLYPHEIDAE** Winckler

GLYPHEA ARBORINSULARIS Etheridge Jr.

Plate 4, figures 2-3; figure 3

Glyphea arborinsularis Etheridge Jr., 1917, Publ. Geol. Surv. Qd., 260, p. 8, pl. 1, fig. 6, pl. 2, figs. 2, 3.

MATERIAL.—Type, F. 1309, Woody Island, Hervey Bay, South-east Queensland (U.Q.). Nearly complete, but flattened right side of carapace; in grey-black bituminous limestone.

F. 1304, F. 1305, F. 1315, Woody Island, Hervey Bay, South-east Queensland (U.Q.).

F. 907, Bucca Crossing, Kolan River, South-east Queensland (G.S.Q.).

F. 16279, near Hughenden, North-central Queensland (U.Q.).

AGE.—Aptian (Blythesdale Group and Maryborough Formation).

Carapace length.—Type (without rostrum), 51 mm.

Carapace elongate, slightly less than half body length; posteriorly deeply concave; median dorsal carina weak, most prominent posteriorly. Regions well defined, conspicuously ornamented with conical tubercles.

Rostrum short, slightly upturned at tip. Gastric region about two-fifths length of carapace; dorsally with line of small tubercles bordering posterior half of median suture; laterally with three subparallel, apically tuberculate carinae, increasing in strength ventrally; middle carina produced antero-dorsally, bordering anterior margin of carapace; ventral carina anteriorly with slight ventral curvature. Gastro-orbital furrow in granulated area below middle carina; short, with shorter vertical branches. Cervical furrow deep, slightly oblique, curving slightly antero-ventrally toward its rounded junction with antennar furrow. Antennar furrow posteriorly bordering slightly elevated, finely tuberculate lobe ventrally; anteriorly curving and delimiting smooth, narrowing marginal rim. Hepatic furrow posteriorly deep, with short dorsal projection; the furrow separating densely and finely tuberculate hepatic lobe and somewhat inflated, sparsely tuberculate subtriangular lobe. Latter lobe subdivided by oblique depression; bounded posteriorly, partially by branchio-cardiac furrow, but mainly by furrow linking branchio-cardiac and post-cervical furrows and produced dorsally to point opposite gastro-orbital furrow. Inferior furrow curved, deep.

Branchio-cardiac furrow prominent, slightly sinuous, meeting dorsal carina at one-fifth of its length from posterior. Post-cervical furrow posteriorly joining branchio-cardiac near carina at an acute angle; deep near its junction with transverse furrow; anteriorly weak. Cardiac region coarsely tuberculate; branchial region with coarse tubercles dorsally, becoming finer and denser ventrally. Marginal furrow dorsally deep.

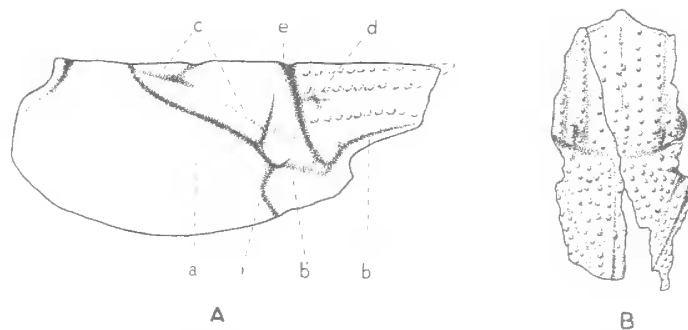


Figure 3. *Glypheia arborinsularis* Etheridge Jr. A. Right side of carapace showing furrows, F. 1309 (U.Q.). B. Compressed dorsal fragment of carapace, drawn from cast from F. 16279 (U.Q.). Both natural size.

First six abdominal segments smooth, each anteriorly with deep transverse furrow; this furrow in second to fifth segments meeting subhorizontal furrow delimiting large pleurite, and then produced ventrally, curving subparallel to margin of pleurite. Tergites of first four segments, each laterally with oblique furrow reaching posterior margin dorsal to rounded tubercle. Pleurite of first segment wing-like anteriorly; ventral margins of remainder curved, sharper in posterior segments, distinctly angular in elongate sixth segment. Telson unknown.

First pereopods elongate, granulated; propodus flattened. Uropods large, ridged and furrowed; exopodite with oblique diaeresis.

The specimens of *G. arborinsularis* from Woody Island and Bucca Crossing were derived from rocks of the Maryborough Formation, which has been equated with the Australiceratan Stage of the Roma Formation of Aptian age (Whitehouse, 1928, p. 280). The remains from Bucca Crossing, preserved in grey cherty shale (F. 907, G.S.Q.), are very fragmental and compressed, but sufficient of the structure of the abdominal segments is retained to confirm their earlier doubtful reference by Etheridge Jr. (1917, p. 10) to this species.

The specimen from near Hughenden (F. 16279, U.Q.) consists of an incomplete external mould of a carapace anterior to the branchio-cardiac furrow. It is preserved in mauve non-calcareous siltstone, placed by the collector, Dr. F. W. Whitehouse, in a marine horizon of Aptian age near the top of the dominantly freshwater Blythesdale Group (personal communication). This example is slightly older than the material from the type locality, since the Roma Formation conformably succeeds the Blythesdale Group in the Lower Cretaceous sequence in the Great Artesian Basin. During preservation the fragment was subjected to dorsal compression with the result that ornament is partially obliterated medially (figure 3B). The distribution of ornament is similar to that of the other specimens, but the tubercles, even considering their compressed condition, appear smaller.

The weakness of the post-cervical furrow, particularly noticeable in *G. arborinsularis*, is a characteristic of many Cretaceous species of the genus. *G. arborinsularis* stands apart from these congeners because of the elongate carapace, the strength and elongation of the furrow posteriorly bounding the subtriangular lobe, and the absence of a transverse furrow connecting the branchio-cardiac and post-cervical furrows near their mid-length.

GLYPHEA OCULATA sp. nov.

Plate 4, figure 4; figure 4

MATERIAL.—Type, F. 3233, Currane, 10 miles N. of Dartmouth, Central Queensland (Q.M.). Posteriorly incomplete carapace with fragmentary appendages, and counterparts; in buff calcareous siltstone.

AGE.—Upper Albian (Tambo Formation).

Carapace subcylindrical; regions well defined, ornamented with rounded tubercles.

Rostrum short, upturned at tip. Gastric region dorsally with line of fine tubercles bordering posterior half of median suture; laterally with three apically tuberculate carinae, increasing in strength ventrally; ventral carina convex upwards. Gastro-orbital furrow short, shallow, branched. Cervical furrow deep, slightly oblique, with rounded junction with antennar furrow. Antennar furrow posteriorly bordering finely tuberculate lobe ventrally; anteriorly curving and fading, delimiting prominent granulated marginal rim. Hepatic furrow posteriorly deeper, with short dorsal projection; the furrow separating densely tuberculate hepatic lobe and an angulate lobe dorsal to it. Latter lobe subdivided by short, oblique furrow; bounded posteriorly partially by branchio-cardiac furrow, but mainly by furrow linking branchio-cardiac and post-cervical furrows, then curving dorsally, becoming parallel to cervical furrow, and fading opposite middle gastric carina. Inferior furrow curved, deeper ventrally.

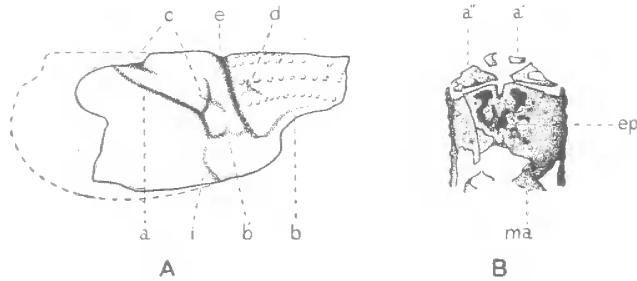


Figure 4. *Glyphea oculata* sp. nov. A. Right side of carapace showing furrows, drawn from cast from prepared counterpart, F. 3233 (Q.M.); natural size. B. Epistome and adjacent appendages, F. 3233 (Q.M.); x 1.5.

a' antennule; *a''*, antenna; *ep*, epistome; *ma*, mandible.

Branchio-cardiac furrow prominent. Post-cervical furrow posteriorly joining branchio-cardiac at acute angle; deep near its junction with transverse furrow; anteriorly very indistinct. Cardiac region coarsely tuberculate; branchial region with coarse, rounded tubercles dorsally becoming finer and denser ventrally.

Eyes large, globular (diameter 5.2 mm.); peduncle relatively slender. Antennal peduncle elongate (ca. 20 mm.); basal segment distinct from epistome, ventrally with a tubercle; antennal scale pointed, extending to level of distal end of fourth segment. Epistome not fused with sidewall of carapace; strongly convex transversely, convex longitudinally; sparsely granulated; deeply notched antero-medially; with prominent ovate tubercle postero-medially. Body of mandible bifid distally; palp slender. Third maxillipeds elongate, pediform, but shorter than first pereopods; terminal segments flattened, lateral margins convergent distally; penultimate with broad median ridge.

First pereopod with merus rather stout, somewhat compressed, granulated laterally, closely and finely spinate marginally.

The type specimen is the sole representative of *G. oculata* and its isolated occurrence among approximately two hundred decapod fossils recently collected from the Dartmouth area indicates the rarity of the species. *G. oculata* displays some resemblance to *G. arborinsularis* Etheridge Jr., from the Aptian of Queensland, but differs in the weakness of the antennar furrow, the granulation of the rim it delimits, the shape and ornamentation of the lobe dorsal to the hepatic lobe, the extreme weakness of the post-cervical furrow, the general ornament of rounded as opposed to conical tubercles, and the relative stoutness of the merus of the first pereopod.

An important feature of the specimen is the partial preservation of the epistome and adjacent appendages. Woods (1926, p. 41; 1927, p. 61) described a rather similar ventral plate in specimens of *G. cretacea* McCoy, but interpreted it as the epistome fused with the basal antennal segments and regarded the structure as one which, if confirmed, would be evidence of palinurid affinities of the Glypheidea. Although the aperture of the antennal gland cannot be seen, the tuberculation of the basal segment and its separation from the epistome in *G. oculata* suggest that the Glypheidea cannot be closely related with the Scyllaridea, while the freedom of the epistome from the sidewall of the carapace precludes their relationship with the Palinura as a whole. The Glypheidea are separated from the Palinura in the classification of the Decapoda proposed by Beurlen and Glaessner (1930).

Tribe **NEPHROPSIDEA** OrtmannFamily **ERYMAIDAE** van Straelen**ENOPLOCLYTIA** McCoy

Enoploclytia is dominantly a Cretaceous genus but ranges from the Oxfordian to the Paleocene. It is similar in many of its characters to *Eryma* von Meyer, dominantly Jurassic, but ranging to the Neocomian. In *Enoploclytia* the ornament of the regions of the carapace anterior to the post-cervical furrow and of the first pereopods is coarser, but may be less dense, than that of the remainder of the carapace. This character is the only one which can be consistently used to separate the genus from *Eryma*, and, even so, the degree of differentiation of carapace ornament is variable. The variability of the carapace furrowing in *Enoploclytia* and its parallelism with that in *Eryma* have already been discussed (p. 156).

A considerable number of species from Europe, North America, and Australia have been referred to *Enoploclytia*, but their grouping into more than one genus seems desirable. Mertin (1941, p. 161) proposed the recognition of two subgenera, *Enoploclytia* McCoy and *Palaeastacus* Bell, based on the shape and ornament of the first chelipeds, but it is felt that the ultimate grouping of species at present assigned to the genus *Enoploclytia* must also involve consideration of the carapace furrowing as one of the prime taxonomic criteria. Such an arrangement may cut across *Eryma* and *Enoploclytia* as currently defined. In the present work however, in view of the restricted occurrence of *Enoploclytia* in this continent, it has been decided to follow the broad interpretation of the genus of Woods (1930, p. 81).

ENOPLOCLYTIA TENUIDIGITATA sp. nov.

Plate 5, figures 1-4 ; figure 5

MATERIAL.—Type, F. 13410, Boomers, Wrotham Park, Walsh River, North Queensland (U.Q.). Partially decorticated and dorsally compressed carapace with fragmentary appendages, and counterpart; in grey concretionary argillaceous limestone.

F. 13417, Boomers, Wrotham Park, Walsh River, North Queensland (U.Q.).

AGE.—Aptian (Roma Formation).

Carapace length.—Type, 53 mm.

Carapace conspicuously furrowed, finely tuberculate, with largest tubercles on gastric region. Median dorsal suture anteriorly bifurcating on gastric region and enclosing narrow fusiform area; posteriorly on median carina on branchial region.

Rostrum slender, one-seventh length of carapace. Gastric region three-eighths length of carapace; laterally finely tuberculate, with admixture of larger tubercles, particularly those in narrow band extending obliquely anteriorly from slightly inflated lobe ventral to gastro-orbital furrow; dorsally with largest, somewhat anteriorly directed tubercles, rather sparsely distributed, and including two rows parallel to median fusiform area. Cervical furrow deep, sinuous near junction with short, deep gastro-orbital furrow; curving antero-ventrally at rounded junction with antennar furrow. Antennar furrow prominent, bordering narrow anterior projection of hepatic lobe. Hepatic furrow irregular; anteriorly forming short link between cervical and post-cervical furrows, dorsal to eminence omega on finely tuberculate hepatic lobe; posteriorly deeply concave, linking post-cervical and branchio-cardiac furrows. Inferior furrow prominent, slightly oblique.

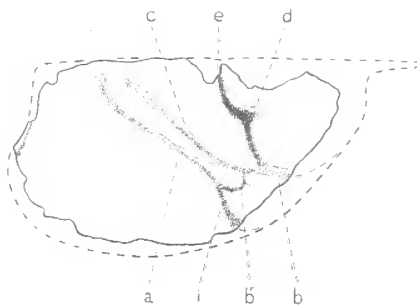


Figure 5. *Enoplocyrtia tenuidigitata* sp. nov. Flattened right side of carapace showing furrows, drawn from cast from prepared counterpart, F. 13417 (U.Q.); natural size.

Branchio-cardiac furrow very oblique, slightly sigmoidal, weak in middle of its course, stronger ventrally, and dorsally, but failing to reach mid-line. Post-cervical furrow extensive, but also fading dorsally; slightly convex toward branchio-cardiac in ventral half and locally confluent with it in narrow depressed area. Antero-cardiac region slightly inflated, ornamented with tubercles slightly smaller but more densely distributed than those on dorsal part of gastric region. Postero-cardiac region more finely tuberculate. Branchial region restricted to one-sixth length of carapace dorso-medially; ornamented by reticulum of small coalesced tubercles, bordered anteriorly by complementary crescentic depressions. Marginal furrow dorsally deep, delimiting sharp keel.

Abdomen with first two segments small, strongly convex transversely; coarsely and densely punctate, rough, with irregular rims around punctae. First segment with smooth, deep transverse furrow; pleural wing small, anteriorly acute. Second segment anteriorly and posteriorly with smooth transverse furrows; pleurite delimited by smooth, shallow subhorizontal furrow.

Antennal peduncle stout; antennal scale prominent, slender and pointed, but not reaching base of flagellum. First chelipeds large, elongate, subequal; merus triangular in section, expanded distally, with fine tubercles in longitudinal rows; carpus subtriangular, thick, dorso-laterally with longitudinal furrow; palmar portion of propodus over two-fifths length of carapace, almost equally broad, compressed, more convex dorso-laterally, with an oblique furrow posterior to base of pollex. Dactylus and pollex remarkably long, slender, over four-fifths length of carapace while incomplete. Carpus and palm punctate, densely but unevenly tuberculate, with largest tubercles, including a sublongitudinal line of six on middle of dorso-lateral surface, similar to those on gastric region; dactylus sparsely punctate, minutely wrinkled.

Apart from the type and figured specimens, other very fragmentary remains of *E. tenuidigitata* from the same locality are in the collections of the Department of Geology, University of Queensland. The species is notable for the degree of development of the branchio-cardiac and post-cervical furrows and their rounded ventral junction with the hepatic furrow, a feature which can be matched only in *E. terrae-reginae* Etheridge Jr. from the Albian of Queensland and *E. kimzeyi* (Rathbun) from the Campanian of Texas, U.S.A. *E. tenuidigitata* differs from the former in the spatial arrangement of the carapace furrows, in the tuberculation of the branchial region, in the shape of the palmar portion of the propodus, and in the relative weakness of the ornament and less conspicuous tendency for the largest tubercles to occur in sublongitudinal rows thereon. From the fragmentary remains of the latter, figured by Rathbun (1935), it differs in the spatial relationship of the carapace furrows, and in the shape and ornament of the palm.

Some of the remains of *E. tenuidigitata* are encrusted with slender sinuous tubes of a lime-secreting annelid such as *Serpula* sp.

ENOPLOCLYTIA sp.

Callianassa (?) sp. Etheridge Jr., 1917, Publ. Geol. Surv. Qd., 260, p. 10, pl. 2, fig. 4.

MATERIAL.—F. 1280, Walsh or Mitchell River?, North Queensland (Q.M.). Incomplete first left cheliped in grey argillaceous limestone.

AGE.—?Aptian (Roma Formation).

This specimen is probably referable to *E. tenuidigitata*. While smaller, it is similar to the cheliped of the type in form and ornament, except that the dorso-lateral furrow on the carpus is less pronounced and the oblique furrow on the propodus at the base of the pollex can not be observed. The mode of preservation and the matrix are very similar to those of specimens from Wrotham Park.

ENOPLOCLYTIA TERRAE-REGINAE Etheridge Jr.

Plate 4, figures 5–9; figure 6

Enoploclytia terra-reginae Etheridge Jr., 1914, Rec. Aust. Mus., 10, p. 273, pl. 23, pl. 24, fig. 1.

MATERIAL.—Type, Barcoo River Watershed, South Central Queensland (A.M.). Nearly complete, but partially decorticated and laterally compressed carapace and counterpart of right side.

F. 3234, F. 3235, F. 3236, Currane, 10 miles N. of Dartmouth, Central Queensland (Q.M.).

AGE.—Upper Albian (Tambo Formation).

Carapace lengths.—Type (slightly incomplete), 90 mm.; F. 3234, 49 mm.

Carapace large, conspicuously furrowed, but lightly ornamented; tuberculate anterior to post-cervical furrow.

Rostrum of moderate length, spinate at base. Gastric region three-eighths length of carapace; laterally with small rounded tubercles becoming larger but less densely distributed dorsally. Cervical furrow deep, slightly sinuous, becoming nearly vertical ventral to junction with short, broad, shallow gastro-orbital furrow; curving antero-ventrally at its rounded junction with antennar furrow. Antennar furrow weakening anteriorly, bordering narrow anterior projection of hepatic lobe; then produced dorsally to base of rostrum. Hepatic furrow irregular, anteriorly forming short link between cervical and post-cervical furrows, dorsal to eminence omega on lightly tuberculate hepatic lobe; posteriorly concave, linking post-cervical and branchio-cardiac furrows. Inferior furrow prominent, curving antero-ventrally.

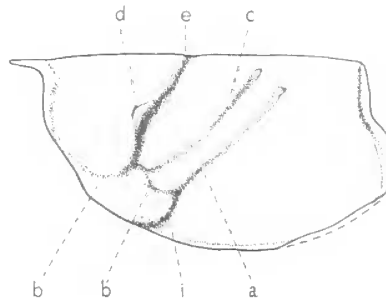


Figure 6. *Enoploctytia terrae-reginae* Etheridge Jr. Flattened left side of carapace showing furrows, F. 3234 (Q.M.); natural size.

Branchio-cardiac furrow oblique, slightly sigmoidal, weakening dorsally (this condition is exaggerated in laterally compressed specimens), stronger ventrally. Post-cervical furrow extensive, subparallel to branchio-cardiac; stronger than it dorsally, but slightly weaker ventrally. Antero-cardiac region slightly inflated, tuberculate like lateral part of gastric region; postero-cardiac region nearly smooth, with weak depressed area in ventral half. Branchial region restricted to one-sixth length of carapace dorso-medially; weakly ornamented with reticulum of low crescentic elevations flanked by complementary depressions, weaker towards branchio-cardiac furrow (ornament appears as fine sparse granules in decorticated specimens). Marginal furrow dorsally deep, delimiting prominent marginal keel; furrow and keel weakening ventrally.

Abdomen with fifth segment short; tergite anteriorly with deep transverse furrow; laterally inflated and separated from pleurite by broad subhorizontal depression; pleurite ventrally rounded. Sixth segment longer, pleural margin acutely rounded. Telson large, slightly convex transversely; margins tapering, then rounded posteriorly; antero-medially with eminence with two small tubercles set transversely; otherwise with two lateral, posteriorly divergent ridges, and two weak subparallel ridges mesiad. Telson sparsely punctate, ridges finely granulated.

First chelipeds large; palmar portion of propodus two-fifths length of carapace, longer than broad, compressed, but more convex dorso-laterally, ventro-internal surface with prominent longitudinal furrow posterior to dactylus; palm ornamented with tubercles varying greatly in size, largest quite spinous and tending to an arrangement in sublongitudinal rows (notably a set of five near middle of each side); margins diverging distally; inner margin with somewhat forwardly directed spines. Dactylus and pollex slender, suboval in section, with small blunt teeth. Uropods oval, ridged and furrowed, punctate; exopodite laterally with short spine, near slightly oblique diacresis.

The recent collection of additional specimens of *E. terrae-reginae* confirms its occurrence in the Tambo Formation. This was previously uncertain owing to the lack of precise locality data accompanying the original description of Etheridge (1914). The additional carapace remains are much smaller than the type, but the isolated cheliped remnant (pl. 4, fig. 7) would have belonged to an individual with a carapace comparable in size with the type. The carapace remains from near Dartmouth show splitting of each carapace along the median dorsal suture and dissociation of the halves, apparently during moulting.

A morphological comparison of *E. terrae-reginae* with the older *E. tenuidigitata* Woods from the Aptian of Queensland has already been made.

Family **NEPHROPSIDAE** Stebbing

HOPLOPARIA McCoy

There is considerable disagreement in the literature on the status of this genus (type species, *H. longimana* (Sowerby), Cretaceous). Woods (1930) and van Straelen (1936 a) treated it as a synonym of *Homarus* Milne-Edwards (type species, *H. vulgaris* Milne-Edwards, Recent)=*Homarus* Weber (type species, *H. gammarus* (Linn.)). Beurlen and Glaessner (1930) regarded *Homarus* as an evolutionary development of *Hoploparia* of the Cretaceous. Mertin (1941), in an extensive study of fossil Nephropsidae, expressed a similar view, but indicated that *Hoploparia* ranged into the Lower Tertiary. He provided generic diagnoses for *Homarus*, *Hoploparia* and the related Cretaceous genera *Oncopareia* Bosquet and *Palaeohomarus* Mertin.

While a close phylogenetic relationship is apparent, morphological differences are sufficient to allow generic distinction to be maintained. Species of *Hoploparia* differ from those of *Homarus* in the relatively longer, but less spinous rostrum, the more granulated carapace, the development of the antennar ridge, the greater development of the carapace furrows (including some ventral extension of the branchio-cardiac furrow), the relatively larger abdominal pleurites, and the lighter and more attenuate first chelae.

HOPLOPARIA MESEMBRIA Etheridge Jr.

Plate 6, figures 1-4; figure 7

Hoploparia mesebria Etheridge Jr., 1917, Publ. Geol. Surv. Qd., 260, p. 7, pl. 1, fig. 5, pl. 2, fig. 1.

Enoplocyrtia mesebria (Etheridge Jr.). van Straelen, 1936, Mem. Mus. roy. d'Hist. nat. Belg., Ser. 2, 3, p. 475; Mertin, 1941, Nova Acta Leop., 10 (n.s.), p. 176.

MATERIAL.—Type, F. 913, Beaconsfield, Central Queensland (G.S.Q.). Fragment of right side of carapace, showing the ventral part of branchio-cardiac furrow, and the cervical, antennar, and hepatic furrows, in buff calcareous siltstone.

F. 914, Beaconsfield, Central Queensland (G.S.Q.).

F. 14930, Currane, 10 miles N. of Dartmouth, Central Queensland (U.Q.); F. 2908, F. 3239, F. 3240, F. 3241, F. 3243, F. 3244, Currane, 10 miles N. of Dartmouth, Central Queensland (Q.M.).

AGE.—Upper Albian (Tambo Formation).

Carapace length.—F. 2908, 90 mm.

Carapace large, about two-fifths body length; subcylindrical, wider posteriorly; median dorsal suture fine; finely tuberculate and punctate.

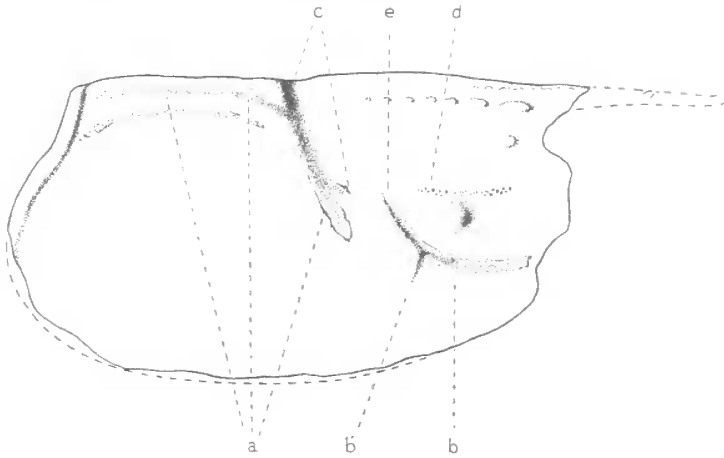


Figure 7. *Hoploparia mesebria* Etheridge Jr. Flattened right side of carapace showing furrows, F. 14930 (U.Q.); natural size.

Rostrum long, slender, about one-fourth length of carapace; slightly upturned anteriorly; armed at mid-length with pair of small antero-dorsally directed spines; posteriorly channelled, with carinae so formed produced posteriorly and weakening to two slightly divergent rows of four

tubercles. Tubercles on dorsal part of gastric region coarser than on remainder of carapace; rather flattened, transversely elongate and punctate on crescentic anterior periphery. Supra-orbital carina reduced to row of tubercles, anterior one largest and spinous, others decreasing in size posteriorly. Suborbital spine small, sharp, anteriorly directed. Antennar ridge slightly oblique, terminating anteriorly in small spine; posteriorly divided at more than one-third of its length by stronger ventral projection of very weak gastro-orbital furrow; this posterior part crowned with somewhat anteriorly directed tubercle. Gastric region densely punctate laterally. Cervical furrow short, oblique, ventrally forming smooth curve with antennar furrow. Antennar furrow anteriorly weakening, subhorizontal. Hepatic furrow short, slightly oblique, posterior to low eminence omega. Hepatic lobe finely tuberculate, vaguely delimited posteriorly by weak indication of inferior furrow in some specimens.

Branchio-cardiac furrow posteriorly very weak, sublongitudinal, fading and failing to reach posterior margin; bounded laterally by slightly curved, feeble carina, itself flanked by vague depression; anteriorly with short, locally deeper branch, directed postero-mesial but failing to reach suture, laterally becoming confluent with deeper, dorsally transverse post-cervical furrow; both oblique on side-wall, then diverging; post-cervical curving but fading antero-ventrally toward dorsal part of cervical furrow; branchio-cardiac produced parallel to cervical, weakening and fading ventrally. Branchial region antero-ventrally finely tuberculate like hepatic lobe elevations weakening and becoming more transverse posteriorly, with punctae appearing in complementary anterior arcuate depressions; dorsally with ornament restricted to transverse punctate depressions. Marginal furrow dorsally narrow, deep; delimiting prominent, flattened rim.

Abdomen long, strong; strongly convex transversely; finely and densely punctate. Tergites of first six segments each with prominent anterior transverse furrow; produced and curving postero-ventrally then weakening on pleurites of second to sixth segments. Pleurites of second to sixth segment also posteriorly with shallow curved furrow. Pleural wing of first segment small, overlapped posteriorly by broadly rounded anterior margin of pleurite of second segment. Pleurites of third to fifth segments subtriangular, with posterior margin sigmoidal and terminating ventrally in postero-ventrally directed spine. Sixth segment and telson with punctae in transverse groups.

Antennal peduncle heavy. First chelipeds large, heavy, unequal; merus ovoid in section, expanded distally, marginally spinate, otherwise smooth, sparsely punctate; carpus marginally with large spines, flattened tubercles and associated punctae, otherwise smooth but with punctae grouped transversely. Right propodus the shorter; palmar portion with inner margin coarsely spinate, outer margin partially flanked by groove produced distally on pollex, dorso-lateral surface with low transverse elevations and complementary anterior depressions; pollex with outer margin forming smooth curve with that of palm, outcurved distally so that tip lies dorsal to that of dactylus; pollex and dactylus bluntly dentate; their length equal to that of palm. Left propodus the longer; inner margin coarsely spinate; pollex and dactylus finely dentate towards tip; their length nearly twice that of palm. Other pereopods slender. Uropods with punctae in transverse depressions flanked by raised anterior rim; exopodite locally spinate marginally, near almost transverse diaeresis.

H. mesembria is the macrurous decapod most commonly preserved in the rocks of the Tambo Formation. The recent collection of more complete material confirms the identity of the abdominal remains doubtfully referred by Etheridge Jr. (1917, p. 7) to this species. At the time of collection of the original material, Beaconsfield was an extensive pastoral property to the north of Dartmouth; Currane, the locality of much of the recent collecting, is one of the areas formed by its subdivision. *H. mesembria* is rather similar to the type species, *H. longimana* (Sowerby) from the Aptian and Albian of Europe, but differs in the finer ornament and the relative proportions of carapace, abdomen, and first cheliped.

Several of the specimens examined show the carapace and associated abdominal remains disposed at right angles and lying on their sides in the bedding plane. This is the characteristic attitude of the moulted exoskeleton of *Hoploparia* as recognised by Glaessner (1929). A few specimens also show evidence of rupture of the carapace along the median suture.

TILLOCHELES gen. nov.

Carapace subcylindrical; rostrum spinate; gastric region dorsally with longitudinal fusiform area bounded by recurved carinae; antennar furrow semicircular; cervical, post-cervical and branchio-cardiac furrows confluent; branchial region without lateral carinae.

Abdomen large, with median longitudinal carina.

First chelipeds elongate, unequal; palmar portion of propodus quadrate in section, laterally heavily tuberculate; dactylus longitudinally flanged.

TYPE SPECIES.—*Tillocheles shannonae* sp. nov.

TILLOCHELES SHANNONAE sp. nov.

Plate 5, figures 5-6; figure 8

MATERIAL.—Type, F. 3252, Currane, 10 miles N. of Dartmouth, Central Queensland (Q.M.). Anteriorly incomplete carapace, with abdomen and fragmentary appendages; in buff calcareous siltstone.

F. 3248, F. 3250, F. 3251, F. 3253, Currane, 10 miles N. of Dartmouth, Central Queensland (Q.M.).

AGE.—Upper Albian (Tambo Formation).

Carapace length.—F. 3251, 39 mm.

Carapace small, about three-eighths body length, subcylindrical, finely tuberculate and punctate.

Rostrum long, acute, one-fourth carapace length; laterally with two antero-laterally directed spines; posteriorly channelled, with carinae so formed diverging, produced on gastric region, armed with small sharp tubercles. Carinae weakening posteriorly, recurving to join near post-cervical furrow; enclosing a fusiform area, anteriorly bisected by short median carina. Orbit bordered by narrow raised rim. Antennar ridge prominent, slightly oblique, appearing as more tuberculate crest of inflated lateral lobe of gastric region; terminating anteriorly in sharp spine. Cervical furrow dorsal to junction with weak subhorizontal gastro-orbital furrow vertical, indistinct; then bent postero-ventrally, then ventrally; deeper above confluence with oblique post-cervical furrow. Antennar furrow prominent, semicircular, cutting antennar ridge at about one-third of its length. Hepatic furrow curved, separating finely tuberculate hepatic lobe, with low rounded eminence omega, and slightly elevated, rounded lobe forming anterior limit of branchial region. Inferior furrow represented by shallow, very finely tuberculate depression.

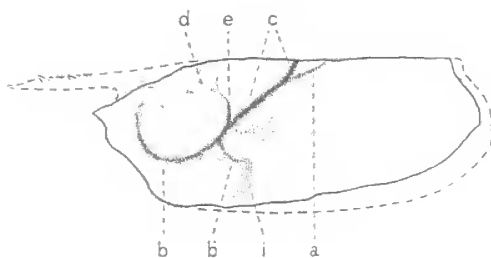


Figure 8. *Tillocheles shannonae* gen. et sp. nov. Left side of carapace showing furrows, F. 3252 (Q.M.); x 1.5.

Branchio-cardiac furrow with posterior branch weak, represented by shallow sublongitudinal depression adjacent to low median carina; anterior branch stronger, directed postero-mesial but fading close to the mid-line, laterally confluent with post-cervical furrow. Post-cervical furrow dorsally deep, slightly oblique; laterally more oblique ventral to junction with branchio-cardiac furrow, flanked posteriorly by apically tuberculate ridge, itself bordered in part by shallow depression. Branchial region ventrally with ornament of fine tubercles, becoming smaller and more transverse laterally, with transition dorsally to low crescentic ridges, flanked anteriorly by complementary depressions. Marginal furrow postero-dorsally deep; marginal furrow there wide, flattened.

Abdomen relatively large, strongly convex transversely; second to sixth segments, except in furrows and depressed areas, conspicuously ornamented with fine anastomosing ridges enclosing punctate areas; also with narrow median longitudinal carina, stronger posteriorly. First segment with deep transverse furrow; pleurite small, wing-like, postero-ventrally passing beneath margin of pleurite of second. Tergites of second to fifth segments each with stronger anterior and weaker posterior transverse furrows, produced ventrally and curving into relatively smooth and depressed area on pleurite; pleurite of second broadly rounded with prominent postero-ventral tubercle; pleurites of third to fifth subtriangular, blunt, antero-ventral margins arcuate, postero-ventral margins sigmoidal; pleurite of third with large tubercle; pleurite of sixth delimited by oblique furrow. Telson laterally flattened; postero-medially with acute triangular depressed area; coarsely punctate; lateral margins convergent posteriorly, with fine posteriorly directed spines; posterior margin rounded.

First chelipeds long, large, unequal. Merus of left gradually expanding distally, laterally smooth, marginally tuberculate; carpus thicker, ovate in section, laterally with four longitudinal rows of close-set rounded tubercles; propodus slightly longer than carapace; palmar portion quadrate in section, marginally finely tuberculate, dorso-laterally with largest rounded tubercles concentrated on obtuse longitudinal crest; pollex with large compressed tooth at mid-length, cutting margin otherwise closely and finely scalloped, compressed; dactylus laterally with narrow longitudinal flange, proximally with three large rounded tubercles, cutting edge finely scalloped, with complementary depression at mid-length. Propodus of right with additional row of large rounded tubercles flanking dorsal margin of palmar portion; pollex with heavy, bluntly rounded tooth towards mid-length, otherwise only closely, bluntly dentate distally; dactylus laterally with rounded longitudinal flange, proximally tuberculated, cutting edge with two heavy rounded teeth.

Eight examples of *T. shannonae* have been collected but no specimen is sufficiently complete for adequate illustration of the first chelipeds.

The structure of the chelipeds, the ornament of the abdomen, the shape of the antennar furrow and the presence of recurved carinae on the dorsal part of the gastric region indicate a relationship of the new genus with *Paraclytia* Fritsch from the Turonian and Senonian of Europe and *Nephrops* Leach from the Pliocene of England and Recent seas. *Tillocheles*, however, differs from both of these in the confluence of the post-cervical and cervical furrows and the absence of longitudinal carinae or rows of spines on the lateral part of the branchial region. The ornament of the branchial region is akin to that in *Hoploparia* and prevents the inclusion of *Tillocheles* in the subfamily Nephropsinae Mertin as originally defined. The division of the family Nephropsidae into the three subfamilies, Phoberinae, Nephropsinae, and Homarinae, by Mertin (1941, p. 168) is superficially attractive, but the variety in form of the first chelipeds in genera of the Homarinae, and their apparent convergence in this feature with some of the Phoberinae on one hand and the Nephropsinae on the other, together with the difficulty in clearly associating several rare and little known, living and extinct genera, make the division suspect as a natural one.

The species is named for Miss Sanna Shannon in recognition of her discovery and collection of fossil decapods at Currane.

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EXPLANATION OF PLATES.

PLATE 4

Astacodes sp.

Fig. 1. Left side of abdomen ; F. 2907 (Q.M.) ; the height of the first four segments is exaggerated by oblique compression.

Glyphea arborinsularis Etheridge Jr.

Fig. 2. Right side of carapace ; type, F. 1309 (U.Q.).

Fig. 3. Left side of abdomen ; F. 1304 (U.Q.).

Glyphea oculata sp. nov.

Fig. 4. Right side of carapace ; cast from type, F. 3233 (Q.M.).

Enoploclytia terrae-reginae Etheridge Jr.

Fig. 5. Left side of laterally compressed carapace ; F. 3234 (Q.M.).

Fig. 6. Dorso-lateral surface of first right chela ; cast from F. 3234 (Q.M.) ; margin restored from actual specimen.

Fig. 7. Ventro-internal surface of first left chela ; cast from F. 3236 (Q.M.).

Fig. 8. Right side of carapace ; F. 3235 (Q.M.).

Fig. 9. Posterior part of abdomen ; F. 3235 (Q.M.).

All natural size.

PLATE 5

Enoploclytia tenuidigitata sp. nov.

Fig. 1. Dorsal surface of carapace ; type, F. 13410 (U.Q.).

Fig. 2. Right side of dorsally compressed carapace ; type, F. 13410 (U.Q.).

Fig. 3. Incomplete first left cheliped ; type, F. 13410 (U.Q.).

Fig. 4. Right side of laterally compressed carapace ; cast from F. 13417 (U.Q.).

All natural size.

Tillocheles shannonae gen. et sp. nov.

Fig. 5. Left side of carapace and abdomen ; type, F. 3252 (Q.M.) ; x 1.5.

Fig. 6. Left side of laterally compressed carapace ; F. 3251 (Q.M.) ; x 1.5.

PLATE 6

Hoploparia mesembria Etheridge Jr.

Fig. 1. Right side of laterally compressed carapace and abdominal fragment ; F.14930 (U.Q.).

Fig. 2. Right side of carapace and abdomen ; F. 3243 (Q.M.).

Fig. 3. Dorso-lateral surface of first right chela ; F. 3244 (Q.M.) ; (from small individual, slightly larger than F. 3243).

Fig. 4. Dorsal surface of dorsally compressed carapace ; F. 2908 (Q.M.).

All natural size.